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Managing Soybean Insects

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Managing Soybean Insects

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Many insects feed on soybeans and can threaten yield and/or quality. However, the frequency and severity of pest damage vary considerably between production areas—even within and between fields—and from season to season. (In Texas, the Gulf Coast and Lower Rio Grande Valley counties are most likely to experience economic losses.) Therefore, it is important to inspect plants regularly and base control decisions on established economic thresholds or action levels.

Pest Management Principles

The term integrated pest management (IPM) applies to a philosophy used in the design of insect, mite, disease and weed control programs. IPM encourages the use of the most ecologically sound combination of effective pest suppression techniques. The IPM concept assumes that pests can be tolerated to some degree unless they cause economic loss. The first line of defense against them is prevention through the use of good agronomic practices or cultural methods that discourage pest population development. Control measures are implemented only when pest populations reach levels at which crop damage could result in losses greater than the cost of the treatment. This is called the economic threshold level or action level. Regular field scouting helps determine if and when that level is reached. Precise timing and execution of each production operation is essential. In short, IPM strives to optimize rather than maximize pest control efforts.

The economic thresholds or action levels presented in this publication should be used only as rules of thumb. Several factors affect the level of damage soybean plants can tolerate before the cost of a control tactic (such as the use of an insecticide) becomes profitable. These factors include the anticipated market value of the crop, anticipated yield, and the cost of the treatment. In general, when the market value of soybeans is high and/or the cost of control is low, economic threshold levels may actually decrease (fewer pests or pest damage can be tolerated). Threshold levels presented here may also change with the growing season, the presence of different pests, the type of damage, plant growth stage, and general plant vigor.

Variety Selection and the Early Soybean Production System

Some soybean varieties suffer more damage from certain pests (particularly caterpillars) than others. Other varieties are resistant to or tolerant of several of the major defoliating pests. Data on the yield potential for various soybean varieties in different areas of the state are available from your county Extension agent.

The Early Soybean Production System (ESPS) is a relatively new and popular method of growing soybeans in Texas. The ESPS, as practiced on the Upper Gulf Coast and in northeast Texas, relies on planting early-maturing soybeans (Maturity Groups IV and V) in April and harvesting in September. In the conventional system, later maturing soybeans (Maturity Groups VI, VII and VIII) are planted in May and June and harvested in October and November. Generally, soil moisture is lowest on the Gulf Coast and in northeast Texas in July and August when conventionally grown soybeans are in the crucial pod-fill stage of development. ESPS soybeans are usually beyond the pod-fill stage at this time. Adequate soil moisture allows ESPS soybeans to fill properly. Insect damage also is affected by plant maturity. For instance, defoliating caterpillars usually attack conventionally grown soybeans from late August to mid- September when ESPS soybeans are close to maturity and unattractive to insects. ESPS soybeans usually avoid defoliator damage, but are often subject to stink bug infestations earlier in the season, beginning at bloom. For more information on the ESPS, obtain the Early Soybean Production System Handbook from your county Extension agent.

Inspecting Soybean Fields for Insects and Damage

Insect populations in soybean fields can change rapidly. Growers should check fields at least once and preferably twice a week to determine the species present, the pest density, and the amount of damage. Plant damage estimates are also useful in making management decisions.

Ground cloth method: This technique is primarily used to survey for stink bugs and caterpillars, but it is also useful for determining numbers of other species before and after pesticide applications. This method uses an off-white cloth measuring 36 x 42 inches. Staple a thin strip of wood, approximately 1 inch wide, to each short side of the cloth. Select a random site in the field and unroll the cloth from one row over to the next row. Mark off 18 inches on each row bordering the cloth and vigorously shake all the plants within that area. Two 1.5-row-foot sections (3 feet total) will be sampled simultaneously for insects. Count the number of insects that fall on the cloth. Repeat the process in at least ten locations in the field (30 feet of row sampled) and total the counts to get the number of each species per 30 row feet. If the results show that populations are close to threshold levels, or if the field is very large, sample more areas to increase

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confidence in the results. This method is not useful in drilled or broadcast-planted soybean fields. When the soil is wet another method may be more convenient.

Vertical beat sheet method: The vertical beat sheet is another method of sampling insect populations. This device is constructed of galvanized metal flashing, or similarly stiff material, 36 inches wide and crimped to provide a beating surface 34 inches tall and a collecting trough 4 inches wide. The trough is positioned at the base of row-planted soybean plants and arthropods are removed along 36 inches of row by shaking and beating the foliage against the vertically positioned surface. Dislodged arthropods slide into the trough where they can be counted in the field or poured into a container to be counted elsewhere. This method does not require kneeling down between the rows, and can be used to sample weedy fields, fields with standing water in the rows, and narrow-row or drill-planted soybean fields. Economic threshold levels developed for this sampling method are for row-planted soybeans only and should not be used if row spacing is less than 30 inches.

Sweep net method: A standard 15-inch-diameter sweep net is often used for sampling insects on soybeans. Make ten consecutive (180-degree) sweeps while walking through the field, swinging the net from side to side across the row with each step. Then identify and count insects as they are removed from the net. Repeat the sampling procedure in at least ten random sites and total the counts of each species per ten sweeps to determine the number of insects per 100 sweeps. Increasing the number of samples taken from a field increases the accuracy of the population estimates. If the population estimates are close to threshold levels, or if the field is large, sample more areas to increase the accuracy of the results. Economic threshold levels developed for this sampling method are for row-planted soybeans only and should not be used if row spacing is less than 30 inches. The sweep net, however, is one of the few methods of sampling arthropods in drill- or broadcast-planted soybean fields.

Plant damage: Insects damage soybean plants in four ways. Soil insects can feed on germinating seedlings or roots, causing the plants to lose vigor, wilt or die. Above ground, stems can be damaged by tunneling larvae or girdled by the threecornered alfalfa hopper. Foliage can be damaged by chewing caterpillars and beetles, or by the feeding of mites, aphids and thrips. Finally, pods can be hollowed out by corn earworms and seed deformed and discolored by stink bug sucking damage. Estimating the level of insect damage is essential in determining the need for control measures.

Insects that feed on seedlings are important only if stands are damaged to the extent that yields are reduced. Six to eight healthy seedlings per row foot are sufficient for optimum yields. Uniform loss of seedlings is not as detrimental as the loss of all seedlings in portions of a row.

Threecornered alfalfa hoppers girdle the main stems of soybean plants. This damage first appears as slight indentations and later as swellings encircling the entire main stem. Randomly selected row-foot sections, at several locations in the field, should be examined for fresh damage early in the season (3- to 10-inch plants).

Foliage loss from the feeding of caterpillars and beetles is estimated visually. Examine randomly picked individual leaflets and estimate the percent leaf surface missing from each. Select an equal number of leaves from all levels of the plant canopy. Add these estimates together and divide by the total number of leaflets examined to determine the percent defoliation for the different areas of the sampled field. Research has shown that slight leaf-feeding injury may actually increase the yield of late maturity group soybeans. Beyond an initial 10 percent leaf surface loss, however, every additional 10 percent loss can decrease yield by 2 bushels per acre. Yield loss from defoliation depends on the soybean growth stage.

Pod damage is not sampled directly. Insects that cause pod damage are sampled using sweep net or ground cloth techniques.

Soybean Growth and Development

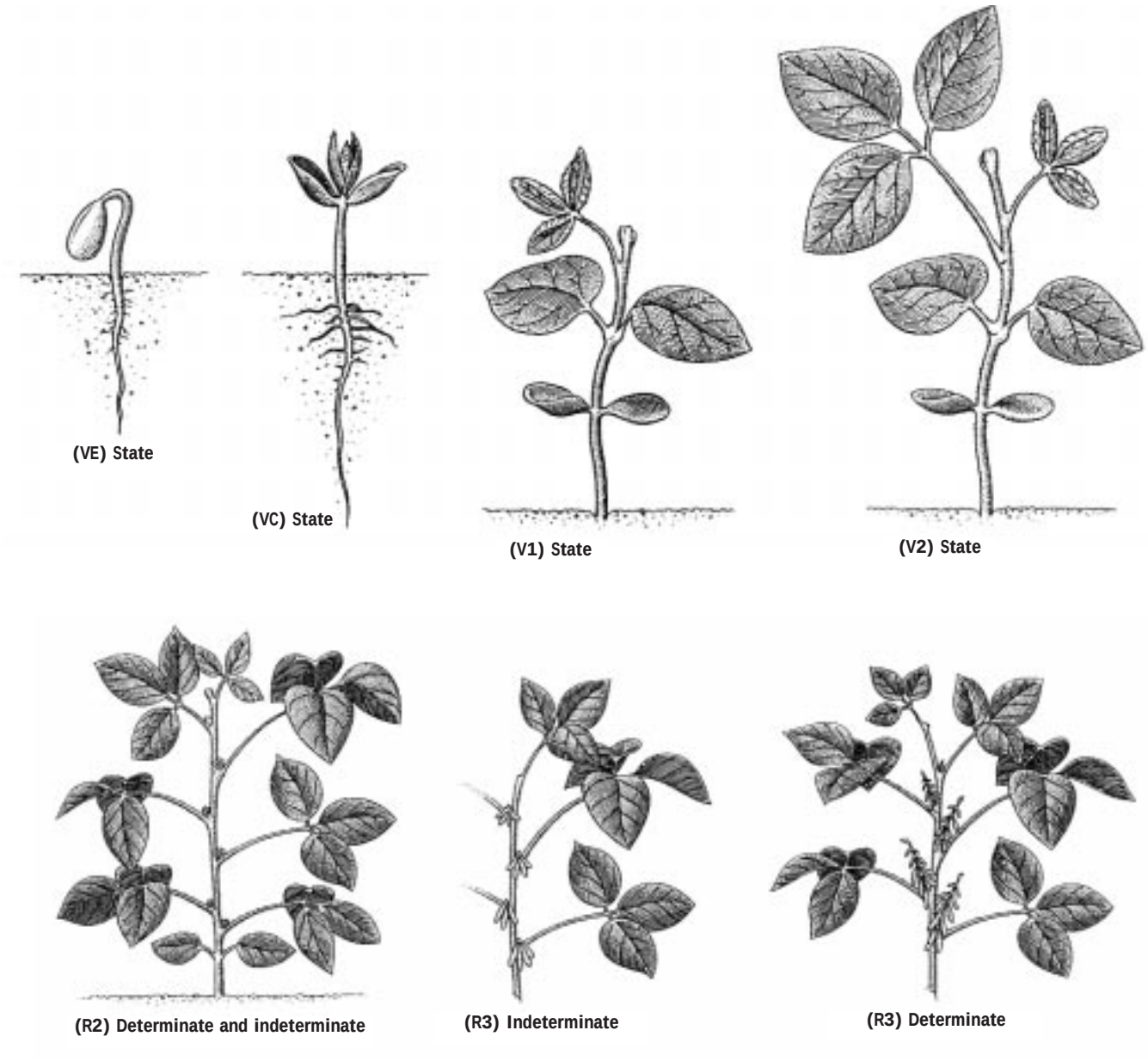
From seed germination to harvest, a soybean crop is under constant attack from a variety of insects. Soybean plants can compensate for substantial levels of insect injury, and yield can even improve with low levels of injury. Losses depend greatly upon the stage of plant growth, so pest economic thresholds vary with the stage of plant development.

Soybean growth stages are designated by the letter V for vegetative or R for reproductive. There are two types of stem growth and flowering in soybeans. In the indeterminate stem type, grown mainly in the northern U.S., the terminal bud continues vegetative growth during most of the season. The plant develops a sparse but even distribution of pods on all branches. In the determinate stem type, grown mainly in the southern U.S., the terminal bud stops vegetative growth when it becomes a flower. Plants develop a dense cluster of pods at the terminal.

Seedling and Early-Season Pests

Threecornered alfalfa hopper. This insect can be found in soybean fields from the seedling stage through maturity. During the seedling stage its feeding causes girdled main stems; in later growth stages petioles are girdled. Plants damaged in early growth stages may not be noticed until they are much older and heavier. Because of the damaged stems, plants may lodge when stressed by wind, rain or cultivation equipment. The restricted flow of nutrients in girdled plants can reduce the number of pods produced. However, this type of damage rarely reduces yield because healthy plants adjacent to damaged plants compensate by producing higher yields. This is a phenomenon known as “plant stand compensation.” Main stem girdling is difficult to prevent with insecticide applications. A better management strategy for this type of damage is to manipulate seeding rates in order

Figure 1. Soybean growth stages and development.



to obtain at least six undamaged plants per foot of row.

Saltmarsh caterpillar. These large, hairy, yellow caterpillars occasionally move into fields from weed hosts early in the season. When numerous, their damage may cause some loss in plant stands near field margins. Spot or perimeter treatments may be required if infestations threaten stands.

Woolly bear caterpillar. These are hairy, black and red caterpillars that cause damage similar to the saltmarsh caterpillar.

Armyworm and beet armyworm. Armyworms are conspicuously striped caterpillars that may occur locally in high numbers. Often they develop in pastures or roadside vegetation and march en masse into fields, eating as they go. They also can develop where moths lay eggs in the field. Young caterpillars feed

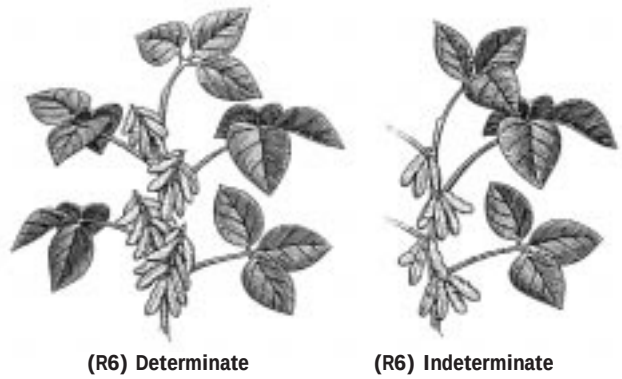


Table 1. Soybean growth stages and accepted codes.

Fehr and Caviness (1977)[1]	Plant development
VE	Emergence
VC	Cotyledon + unfolding unifoliate leaves
V1	First node trifoliate leaves + photosynthesis
V2	Second node
V3	Third node
V4	Fourth node
V5	Fifth node
V6	Sixth node
V(n)	Nth node
R1	Beginning bloom
R2	Full bloom
R3	Beginning pod development
R4	Full pod
R5	Beginning seed
R6	Full seed
R7	Beginning maturity
R8	Full maturity leading to harvest

[1]Fehr, W. R. and C. E. Caviness. 1977. Stages of soybean development. SR80, Iowa State University. The most modern refinement of this system is described in Ritchie, S. W., J. J. Hanway, H. E. Thompson and G. O. Benson. 1989. How a soybean plant develops. SR53, Iowa State University.

close together, causing localized skeletonization and defoliation damage.

Beet armyworms are green to brown with pale stripes along their sides, and a conspicuous black mark on each side of the body above the second pair of true legs. They prefer broad-leaved plants such as soybeans, and are generally more difficult to kill than armyworms because they are tolerant to certain insecticides.

Armyworms and beet armyworms in the Gulf Coast region of Texas rarely cause sufficient damage to warrant treatment. However, in the Texas Panhandle the beet armyworm is the primary foliar feeding caterpillar pest in soybeans.

Lesser cornstalk borer. Seedlings may be damaged by the lesser cornstalk borer. Larvae tunnel into the stem at the soil line, restricting the flow of nutrients to the upper portion of the plant and causing it to wilt and die. The very active, bluish-green caterpillars have brown stripes and are found inside the stem or in a silken tube just below the soil surface adjacent to the stem. These pests are usually found only in well drained, sandy soils; they thrive under dry conditions. Irrigation reduces potential damage. It is important to apply insecticide after planting before extensive stem damage has occurred

Cutworm. Larvae girdle soybean seedlings below the cotyledons, reducing plant stand. Larvae may also feed on foliage. As soybeans can withstand substantial stand reduction without a reduction in yield, control of cutworms is necessary only when unusually large populations occur.

Mid- to Late-Season Pests

Threecornered alfalfa hopper. Petiole girdling by adults and nymphs during the blooming and pod-filling stages can reduce yields.

Foliage feeding pests. Various caterpillars (including armyworms and beet armyworms), beetles and grasshoppers feed on soybean foliage. Because all cause defoliation, they are grouped together for damage estimation purposes. These pests can occur throughout the year, but are most significant from blooming to pod fill when defoliation can cause yield reductions (see Plant damage, p. 4). Infestations may develop very rapidly and completely defoliate soybean fields. Controlling these pests is complicated when several species are involved. Insecticide applied early in the season may cause resurgent populations, making it necessary to treat again (particularly when growing conventional varieties, groups VI-IX).

Velvetbean caterpillars, green cloverworms, soybean loopers, and cabbage loopers are the most common and severe defoliators of Texas soybeans. Velvetbean caterpillar moths migrate into Texas each year in large numbers, and caterpillar populations can build up rapidly. The larvae are green to brown with stripes along their sides, and have four pairs of abdominal prolegs. Although they are relatively easy to control with insecticides, populations often go

undetected until significant damage has occurred. Green cloverworms have three pairs of abdominal prolegs and often require control in the Upper Gulf Coast area. Loopers are green caterpillars with two pairs of abdominal prolegs and a single pair of prolegs at the end of the body; they are sometimes marked with black. The soybean looper occasionally becomes abundant earlier in the season than other loopers, and populations are often composed of all sizes. It is not easy to see the differences between looper species, except at the pupal stage. Soybean loopers pupate in silk-like cocoons attached to the undersides of leaves. The pupae are white, cream or pale green in color. Cabbage looper pupae are brown and pupation occurs at the soil surface.

Late-Season and Pod-Filling Pests

Armyworm. All three armyworm species feed on all growth stages of the soybean plant. Army-worms feed mainly on leaves, but also on pods.

Stink bugs. The southern green stink bug and brown stink bug are the most common species along the Gulf Coast of Texas, although occasionally other species such as the green stink bug are found. Adult stink bugs usually move into fields when soybeans begin to flower. Both adults and nymphs feed by inserting their mouthparts into the beans inside the pods. They also feed on stems, foliage and blooms. Pod feeding may reduce yield and quality of the soybeans, delay maturity (green bean effect), and increase the incidence of yeast spot seedling disease. Large numbers of nymphs can develop during the pod filling period. Because adult females deposit eggs in clusters, nymphs are extremely aggregated. Accurate sampling methods (such as the sweep net method described earlier) are required to estimate average field populations.

Corn earworm. This pest is also known as the cotton bollworm and soybean podworm. Female moths lay eggs on the terminal leaves of soybean plants. Larvae feed for a few days and then move down the plant to feed on developing soybeans. Occasionally, corn earworms are detected during vegetative growth stages. Large populations during the pod-filling stage can reduce yield. Infestations are most common where alternate hosts such as corn, sorghum and cotton are grown nearby.

Soybean stem borer. These long-horned beetles are occasional pests of soybeans in the Texas High Plains. Adults are 3/8 inch long, charcoal gray beetles with long antennae. The larvae are cream-colored, legless grubs. Larvae tunnel soybean stems in July and August, eventually girdling plants at the base. Plants may lodge and become difficult to harvest. Peak girdling activity occurs during September and October. Soybeans should be harvested as soon as possible to minimize losses to the stem borer.

Occasional Pests

Occasional early-season defoliators include cutworms, garden webworms, southern corn rootworm, and banded cucumber beetles Their feeding rarely becomes serious enough to warrant treatment. Several grasshopper species occasionally move into the margins of fields bordered by weedy areas, and at times they require spot treatments. Recently, large numbers of the bean leaf beetle were found in northeast Texas. Populations generally peak in the summer and early fall. Blister beetle larvae are considered beneficial because they destroy grasshopper eggs; however, the adult beetles defoliate soybeans by feeding on leaves, blooms, tender stems, and young pods. Other pests such as thrips, whiteflies and spider mites can damage foliage but rarely require treatment.

Biological Control

The term “biological control” refers to the suppression of pests by their natural enemies. Biological control tactics include the conservation, augmentation and importation of natural enemies. Conservation is the preservation of natural enemies that are already present. The best way to conserve natural enemies is to avoid using insecticides unnecessarily. Augmentation is the mass culturing and periodic release of a natural enemy. Many species of beneficial insects are sold for pest control in soybeans. However, the effectiveness of augmentation in soybeans is unknown and the Texas Agricultural Extension Service cannot provide guidelines for using this method. Importation is the introduction of non-native natural enemies. This method has been effective when an exotic pest has entered Texas without the natural enemies that help control the pest in its native country.

Natural enemies of insects that attack soybeans include spiders, lacewings, lady beetles, ground beetles, rove beetles, syrphid flies, flower flies, hover flies, true bugs (including minute pirate bugs, big-eyed bugs, assassin bugs and damsel bugs), predatory mites, and even fire ants. However, many important natural enemies are rarely seen, such as parasitic wasps and flies, nematodes, and pathogenic bacteria and fungi.

Generally, pesticides kill natural enemies as well as target pests. Once natural enemies have been destroyed, there is no natural (biological) proteciton against insect pests until natural enemy populations recover. This can cause outbreaks of secondary pests or rapid resurgence of pests that were initially suppressed by the pesticide treatment. Pest insects also can develop resistance to pesticides. Using nonchemical control methods, or pesticides that kill only the target pest, protects natural enemies. Insecticide applications should be avoided unless economically damaging levels of harmful pests are detected.

Microbial Insecticides and Insect Growth Regulators

Bacillus thuringiensis (Biobit®, DiPel®, Design®, Agree® and others) is a biological insecticide labeled for control of several foliage-feeding larvae in soybeans. It is not recommended where heavy populations develop during the pod-filling period. This insecticide will not control defoliating beetles, grasshoppers or pod-feeding stink bugs. Using *Bacillus thuringiensis* requires a different approach to insect management. It

is relatively slow acting, much more effective on small worms than large ones, and performs better when applied in large volumes of water per acre (10 to 15 gallons by ground application and 5 to 8 gallons by air) to ensure thorough plant coverage.

Biological insecticides generally suppress pest species without disrupting beneficial species that contribute to natural control. But to be used effectively, there must be regular, careful field monitoring and accurate analysis of the potential for plant damage. Precise application (timing, rate and coverage) is required. Application equipment must be clean so that there is no residue of conventional insecticide that may harm beneficial insects or the biological control organisms being applied.

Virus products (Spod-X®LC, Gemstar®LC) are very specific insecticidal viruses. They do not persist long in the field so correct timing of applications is important. The products do not affect beneficial insects.

Diflubenzuron (Dimilin®) is a compound that prevents certain caterpillars from forming a new exoskeleton (skin) after molting. It is referred to as a "chitin synthesis inhibitor." If pest populations are extremely large (two to three times higher than the threshold) and/or other pests are present (stink bugs, other caterpillar species, etc.) low rates of conventional insecticides may need to be used with diflubenzuron.

Pest thresholds for using biological insecticides may be lower than those for conventional chemical insecticides.

Insecticide Application Methods

Spray applications are most effective, but they should not be made when wind velocity exceeds 15 miles per hour. Nozzle size and number, ground speed, and pump pressure influence the rate of output per acre. Always calibrate the sprayer carefully to ensure that the recommended rate is applied. For ground applications, one nozzle per row may be desirable on larger plants to obtain thorough coverage. For best results with aerial applications, flag swaths so they meet or overlap. Do not fly higher than 15 feet above the plant canopy to reduce drift and maximize coverage. When making any insecticide application, follow label directions. For calibration and safety information refer to B-1648, "Using Pesticides—Private Applicator Manual: General" (Texas Agricultural Extension Service).

Protecting Bees and Other Pollinators from Insecticides

Pollination is extremely important in producing many crops such as alfalfa, clover, vetch and cucurbits. Where pollinating insects are required for flower fertilization, the crop producer, insecticide applicator and beekeeper should cooperate closely to minimize bee losses. The following guidelines will reduce bee losses:

1. Apply insecticides, if practical, before bees are moved into fields or adjacent crops for pollination. When bees are in the vicinity, apply insecticides in late evening or early morning when bees are not foraging. Evening applications after bees have left the field are less hazardous than early morning applications.
2. Use the insecticide least toxic to bees that will be effective against target pests.
3. Do not spray any insecticide directly on bee colonies and prevent insecticide drift. Bees often cluster on the fronts of their hives on hot evenings. Pesticide drift or direct spray at this time generally kills many bees.

Policy for Making Chemical Control Suggestions

The information and suggestions in this publication reflect currently available management options. Our management suggestions are a product of research and are believed to be reliable. However, it is impossible to eliminate all risk. Conditions or circumstances which are unforeseen or unexpected may result in less than satisfactory results even when these suggestions are used. The Texas Agricultural Extension Service will not assume responsibility for risks.

Suggested pesticides must be registered and labeled for use by the Environmental Protection Agency and the Texas Department of Agriculture. The status of pesticide label clearances is subject to change and may have changed since this publication was printed. County Extension Agents and appropriate specialists are advised of changes as they occur.

The USER is always responsible for the effects of pesticide residues on livestock and crops, as well as for problems that arise from drift or movement of pesticides to the property of others. Always carefully read and follow the instructions on the product label.

This publication is based on a previous publication by Bastiaan M. Drees and Michael O. Way. The authors are grateful for the assistance of John A. Jackman, Bastiaan M. Drees, Roy Parker and Noel Troxclair.

Illustrations on page 5 are by James A. Kalisch and John Kalish. They are from **Handbook of Soybean Insect Pests** (1994) published by the Entomological Society of America, and are reprinted with permission.

Soybean Insect Control Suggestions

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
Cutworms ***Agrotis ipsilon, Peridroma saucia, Euxoa auxiliaris, Agrotis orthogonia*** **(Noctuidae)**	When stands are threatened. Six healthy seedlings per row-ft. (19.7 per row-m) are sufficient for optimum yields.	Carbaryl				Cutworm problems are more severe where grasses and weeds are allowed to grow before soybean planting.
		(Sevin®80WSP)	1-1.5 lbs./acre	14	14	
		(Sevin®4F)	1-1.5 lbs./acre	14	14	
		(Sevin®XLR plus)	1-1.5 lbs./acre	14	14	
		Permethrin				Direct spray to base of plants and soil several inches on each side of rows.
		(Pounce®25 WP)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce®3.2 EC)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce®WSB)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	Excessive rainfall reduces cutworm populations in some areas.
		(Ambush®)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		Tralomethrin				
		(Scout X-TRA®)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	
		(Scout X-TRA®Gel)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	
		4-lb. Methyl parathion (climbing cutworms only, *Peridroma saucia*)	0.38-1 lb./acre	20	20	
		Lambda-cyhalothrin				
		(Karate®Z)	0.015-0.025 lb. acre	21	Do not graze or feed to livestock.	
		(Warrior®)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		Es-fenvalerate				
		(Asana®XL)	0.03-0.05 lb./acre	21	Do not graze or feed to livestock.	

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
		Thiocarb (Larvin®3.2)	0.5-0.75 lb./acre	28	Do not graze or feed to livestock.	
		Chlorpyrifos (Lorsban-4E)	0.5-1 lb./acre	38	Do not graze or feed to livestock.	
		Chlorpyrifos (Lorsban-15G) apply at planting or post-emergence	8 oz. per 1,000 row-ft.	X	X	
		Bacillus thuringiensis, ss. *kurstaki* (Costar®)	0.12-0.75 lb./acre	0	X	
		(Biobit®XL)	1.5-4.0 pts./acre	0	X	
Armyworm *Pseudaletia unipuncta* (Noctuidae)	When stands are threatened. Six healthy seedlings per row-ft. (19.7 per row-m) are sufficient for optimum yields. Treat when defoliation exceeds 40 percent prebloom, 20 percent during blooming to pod fill, and 35 percent from pod fill to harvest.	Carbaryl (Sevin®80WSP)	1-1.5 lbs./acre	14	14	
		(Sevin®4F)	1-1.5 lbs./acre	14	14	
		(Sevin®XLR plus)	1-1.5 lbs./acre	14	14	
		4-lb. Methyl parathion (to 3rd instar)	1 lb./acre	20	20	
		Lambda-cyhalothrin (Karate®Z, 1st and 2nd instars only)	0.025-0.03 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®, 1st and 2nd instars only)	0.025-0.03 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T, 1st and 2nd instars only)	0.025-0.03 lb./acre	21	Do not graze or feed to livestock.	
		Thiocarb (Larvin®3.2)	0.025-0.75 lb./acre	28	Do not graze or feed to livestock.	
		Chlorpyrifos (Lorsban®4E)	0.5-0.75 lb./acre	28	Do not graze or feed to livestock.	

		Bacillus thuringiensis, ss. *kurstaki*				
		(Costar®)	0.12-0.75 lb./acre	0	X	
		(Biobit®XL, 1st and 2nd instars only)	1.5-5.5 lbs./acre	0	X	
		(Biobit®HP, 1st and 2nd instars only)	0.5-2.0 lbs./acre	0	X	
		(DiPel®ES, 1st and 2nd instars)	2-4 pts./acre	X	X	
		(DiPel®2X, 1st and 2nd instars)	0.5-2 lbs./acre	0	X	
		(DiPel®DF, 1st and 2nd instars)	1-2 lbs./acre	0	X	
		(DiPel®4L, 1st and 2nd instars)	2-4 pts./acre	0	X	
		(DiPel®ES CPI, 1st and 2nd instars)	2-4 pts./acre	0	X	
		Bacillus thuringiensis, ss. *aizawai*				
		(XenTari®, 1st and 2nd instars)	0.5-2 lbs./acre	0	X	
		(Design®, small larvae)	0.25-0.5 lbs./acre (light) 0.5-1.5 lbs./acre (moderate) 1.5-2 lbs./acre (heavy)	0	X	
		(Agree®WG)	0.25-2 lbs./acre	0	X	
Fall Armyworm *Spodoptera frugiperda* (Noctuidae)	When stands are threatened. Six healthy seedlings per row-ft. (19.7 per row-m) are sufficient for optimum yields. Treat when defoliation exceeds 40 percent prebloom, 20 percent during blooming to pod fill, and 35 percent from pod fill to harvest.	Carbaryl				Fall armyworm infestations may be associated with grassy fields or double cropping with a small grain.
		(Sevin®80WSP)	1-1.5 lbs./acre	14	14	
		(Sevin®4F)	1-1.5 lbs./acre	14	14	
		(Servin®XLR plus)	1-1.5 lbs./acre	14	14	
		Tralomethrin				
		(Scout X-TRA®)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
		(Scout X-TRA®Gel)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	
		4-lb. Methyl parathion (to 3rd instar)	1 lb./acre	20	20	
		Methoxychlor 2 EC	0.75-3 lbs./acre	7	Do not graze or feed to livestock.	
		Lambda-cyhalothrin (Karate®Z, 1st and 2nd instars only)	0.025-0.03 lb./acre	21	Do not graze or feed to livestock.	
		(Warrior®, 1st and 2nd instars only)	0.025-0.03 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T, 1st and 2nd instars only)	0.025-0.03 lb./acre	45	Do not graze or feed to livestock.	
		Methomyl (Lannate®SP)	0.25-0.5 lb./acre (see label for further details)	14	See label for feeding restrictions.	
		(Lannate®LV)	0.225-0.3 lb./acre (light to moderate) 0.3-0.45 lb./acre (moderate to heavy)	14	See label for feeding restrictions.	
		Thiocarb (Larvin®3.2)	0.25-0.75 lb./acre	28	Do not graze or feed to livestock.	
		Chlorpyrifos (Lorsban®4E)	0.5-0.75 lb./acre	28	Do not graze or feed to livestock.	
		Diflubenzuron (Dimilin®25W)	0.25 lb./acre	21	Do not graze or feed to livestock.	
		(Dimilin®2L)	0.25 lb./acre	21	Do not graze or feed to livestock.	
		Bacillus thuringiensis, ss. *Kurstaki* (Biobit®XL, 1st and 2nd instars only)	1.5-5.5 lbs./acre	0	X	

		(Biobit®HP, 1st and 2nd instars only)	0.5-2.0 lbs./acre	0	X	
		(DiPel®ES, 1st and 2nd instars)	2-4 pts./acre	X	X	
		(DiPel®2X, 1st and 2nd instars)	0.5-2 lbs./acre	0	X	
		(DiPel®DF, 1st and 2nd instars)	1-2 lbs./acre	0	X	
		(DiPel®4L, 1st and 2nd instars)	2-4 pts./acre	0	X	
		(DiPel®ES CPI, 1st and 2nd instars)	2-4 pts./acre	X	X	
		Bacillus thuringiensis, ss. *aizawai* (XenTan®, 1st and 2nd instars)	0.5-2 lbs./acre	0	X	
		(Design®, small larvae)	0.25-0.5 lb./acre (light) 0.5-1.5 lbs./acre (moderate) 1.5-2 lbs./acre (heavy)	0	X	
		(Agree®WG)	0.25-2 lbs./acre	0	X	
Beet Armyworm *Spodoptera exigua* (Noctuidae)	When stands are threatened. Six healthy seedlings per row-ft. (19.7 per row-m) are sufficient for optimum yields. Treat when defoliation exceeds 40 percent prebloom, 20 percent during blooming to pod fill, and 35 percent from pod fill to harvest.	Nuclear polyhedrosis virus (Spod-X®LC)	100-200 billion occlusion bodies/acre	0	X	This insect feeds on a number of weed species as well as cotton and corn.
		Lambda-cyhalothrin (Karate®Z, 1st and 2nd instars only)	0.03 lb./acre	21	Do not graze or feed to livestock.	Pyrethroid insecticides have sometimes failed to give adequate control.
		(Warrior®, 1st and 2nd instars only)	0.03 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T, 1st and 2nd instars only)	0.03 lb./acre	45	Do not graze or feed to livestock.	
		Es-fenvalerate (Asana®XL, only aids in control)	0.03-0.05 lb./acre	21	Do not graze or feed to livestock.	

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
		Permethrin				
		(Pounce®25 WP)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce®3.2 EC)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce® WSB)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, wettable powder)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, water soluble pack)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		Tralomethrin				
		(Scout X-TRA®)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	
		(Scout X-TRA®GEL)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	
		Methomyl				
		(Lannate®SP)	0.25-0.5 lb./acre (see label for further details)	14	See label for feeding restrictions.	
		(Lannate®LV)	0.225-0.3 lb./acre (light to moderate) 0.3-0.45 lb./acre (moderate to heavy)	14	See label for feeding restrictions.	
		Thiocarb				
		(Larvin®3.2)	0.25-0.75 lb./acre	28	Do not graze or feed to livestock.	

Chlorpyrifos (Lorsban®4E)	0.5-0.75 lb./acre	28	Do not graze or feed to livestock.
Diflubenzuron (Dimilin®25W)	0.25 lb./acre	21	Do not graze or feed to livestock.
(Dimilin®2L)	0.25 lb./acre	21	Do not graze or feed to livestock.
Bacillus thuringiensis, ss. *kurstaki* (Costar®)	0.12-0.75 lb./acre	0	X
(Biobit®XL, 1st and 2nd instars only)	1.5-5.5 lbs./acre	0	X
(Biobit®HP, 1st and 2nd instars only)	0.5-2.0 lbs./acre	0	X
(DiPel®ES, 1st and 2nd instars)	0.2-4 pts./acre	X	X
(DiPel®2X, 1st and 2nd instars)	0.5-2 lbs./acre	0	X
(DiPel®DF, 1st and 2nd instars)	1-2 lbs./acre	0	X
(DiPel®4L, 1st and 2nd instars)	2-4 pts./acre	0	X
(DiPel®ES CPI, 1st and 2nd instars)	2-4 pts./acare	X	X
Bacillus thuringiensis, ss. *aizawai* (XenTari®, 1st and 2nd instars)	0.5-2 lbs./acre	0	X

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
		(Design®, small larvae)	0.25-0.5 lb./acre (light) 0.5-1.5 lbs./acre (moderate) 1.5-2 lbs./acre (heavy)	0	X	
		(Agree®WG)	0.25-2 lbs./acre	0	X	
Podworm (corn earworm or cotton bollworm) ***Helicoverpa zea*** **(Noctuidae)**	During pod elongation (growth stage R-4), 1 larva per row-ft. (3.3 per row-m). At the start of seed filling (R-5 early), 1.5 larvae per row-ft. (5 per row-m). During seed filling (R-5 late), 2 larvae per row-ft. (6.6 per row-m). Nearing the end of seed filling (R-6), more than 3 larvae per row-ft. (9-9 larvae per row-m).	Carbaryl (Sevin®80WSP)	0.53-1.5 lbs./acre	14	14	Larvae feed on soybean pods. Corn earworm infestations are most severe where soybeans are grown near a crop that provides a plentiful nectar source, such as cotton. Adult female moths use the nectar as a food source for egg production.
		(Sevin®4F)	0.5-1.5 lbs./acre	14	14	
		(Sevin®XLR plus)	0.5-1.5 lbs./acre	14	14	
		4-lb. Methyl parathion	1 lb./acre	20	20	
		Lambda-cyhalothrin (Karate®Z)	0.015-0.025 lb./acre	21	Do not graze or feed to livestock.	
		(Warrior®)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		Nuclear polyhedrosis virus (Gemstar®LC)	600 billion occlusion bodies/acre	0	X	
		Permethrin (Pounce®25WP)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce®3.2 EC)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce®WSB)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	

(Ambush®25W, wettable powder)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.
(Ambush®25W, water soluble pack)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.
(Scout X-TRA®)	0.012-0.016 lb./acre	21	Do not graze or feed to livestock.
Tralomethrin (Scout X-TRA®Gel)	0.012-0.016 lb./acre	21	Do not graze or feed to livestock.
Methomyl (Lannate®SP)	0.25-0.5 lb./acre	21	See label for feeding restrictions.
(Lannate®LV)	0.12-0.225 lb./acre (light to moderate) 0.225-0.45 lb./acre (moderate to heavy)	14	See label for feeding restrictions.
Thiocarb (Larvin®3.2)	0.25-0.75 lb./acre	28	Do not graze or feed to livestock.
Chlorpyrifos (Lorsban®4E)	0.5-1 lb./acre	28	Do not graze or feed to livestock.
Bacillus thuringiensis, ss. *kurstaki* (Javelin®WG)	0.25-1.5 lbs./acre	0	X
(Costar®)	0.12-0.75 lb./acre	0	X
(Biobit®XL)	1.5-5.5 lbs./acre	0	X
(Biobit®XL)	0.5-1.0 lb./acre	0	X
(DiPel®ES, 1st and 2nd instars)	1-4 pts./acre	X	X
(DiPel®2X, 1st and 2nd instars)	0.5-1 lb./acre	0	X
(DiPel®DF, 1st and 2nd instars)	0.5-1 lb./acre	0	X
(DiPel®4L, 1st and 2nd instars)	1-2 pts./acre	0	X

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
		(DiPel®ES CPI, 1st and 2nd instars)	1-4 pts./acre	X	X	
		Bacillus thuringiensis, ss. *aizawai* (Agree®WG)	0.25-2 lbs./acre	0	X	
		(XenTari®, 1st and 2nd instars)	0.5-1 lb./acre	0	X	
		(Design®, small larvae)	0.25-0.5 lb./acre (light) 0.5-1.5 lbs./acre (moderate) 1.5-2 lbs./acre (heavy)	0	X	
Saltmarsh caterpillar *Estigmene acrea (Arctiidae)*	Treat if infestations exceed 8 or more larvae per row-ft. (26 larvae per row-m). Spot treatment may be adequate.	Carbaryl (Sevin80®WSP)	1.5 lbs./acre	14	14	Caterpillars feed generally on weeds and grasses. Partially grown larvae often migrate onto row crops, gardens, and landscapes. Contact with their hairy bodies can cause skin irritation.
		(Sevin®4F)	1.5 lbs./acre	14	14	
		(Sevin®XLR plus)	1.5 lbs./acre	14	14	
		Lambda-cyhalothrin (Karate®Z)	0.015-0.025 lb./acre	21	Do not graze or feed to livestock.	
		(Warrior®)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		Es-fenvalerate (Asana®XL)	0.015-0.03 lb./acre	21	Do not graze or feed to livestock.	
		Permethrin (Pounce®25WP)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce®3.2 EC)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	

		(Pounce®WSB)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, wettable powder)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, water soluble pack)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		Methomyl				
		(Lannate®SP)	0.25-0.5 lb./acre (see label for further details)	14	See label for feeding restrictions.	
		(Lannate®LV)	0.225-0.3 lb./acre (light to moderate) 0.3-0.45 lb./acre (moderate to heavy)	14	See label for feeding restrictions.	
		Chlorpyrifos				
		(Lorsban®4E)	0.5-1 lb./acre	28	Do not graze or feed to livestock.	
		Bacillus thuringiensis, ss. *Kurstaki*				
		(Javelin®WG)	0.25-1.5 lbs./acre	0	X	
		(Costar®)	0.12-0.75 lb./acre	0	X	
		(Biobit®XL)	1.5-3.0 lbs./acre	0	X	
		(DiPel®ES CPI, 1st and 2nd instars)	1-2 lbs./acre	0	X	
		(DiPel®ES, 1st and 2nd instars)	1-2 pts./acre	0	X	
Velvetbean caterpillar *Anticarsia gemmatalis* (Noctuidae)	When defoliation exceeds 40 percent prebloom, 20 percent during blooming to pod fill, and 35 percent from pod fill to harvest. Or when 1/2-inch (12-mm) or larger larvae number 4 or more per row-ft.) (13 larvae per row-m) or 150 per 100 sweeps. Four or more larger larvae per row-ft.	Azinphos-methyl				The velvetbean caterpillar is a subtropical insect and is not thought to overwinter in the U.S. Check infestations at weekly intervals to determine damage level.
		(Sniper®2-E)	0.375-0.5 lb./acre	21 or 45 days depending upon dose	Do not graze or feed to livestock.	
		(Sniper®50 PVA)	0.75-1 lb./acre	45	Do not graze or feed to livestock.	
		Carbaryl				
		(Sevin®80WSP)	0.53-1 lb./acre	14	14	
		(Sevin®4F)	0.5-1 lb./acre	14	14	

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
	(13 larvae per row-m) if diflubenzuron is to be used.	(Sevin®XLR plus)	0.5-1 lb./acre	14	14	
		4-lb. Methyl parathion	0.38-1 lb./acre	20	20	
		Methoxychlor 2 EC	0.75-3 lbs./acre	7	Do not graze or feed to livestock.	
		Lambda-cyhalothrin (Karate®Z)	0.015-0.025 lb./acre	21	Do not graze or feed to livestock.	
		(Warrior®)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		Es-fenvalerate (Asana®XL)	0.015-0.03 lb./acre	21	Do not graze or feed to livestock.	
		Permethrin (Pounce®25 WP)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce®3.2 EC)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce® WSB)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, wettable powder)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, water soluble pack)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		Tralomethrin (Scout X-TRA®)	0.012-0.016 lb./acre	21	Do not graze or feed to livestock.	

(Scout X-TRA®Gel)	0.012-0.016 lb./acre	21	Do not graze or feed to livestock.	
Methomyl (Lannate®SP)	0.125-0.25 lb./acre (see label for further details	14	See label for feeding restrictions.	
(Lannate®LV)	0.12-0.225 lb./acre (light to moderate) 0.225-0.45 lb./acre (moderate to heavy)	14	See label for feeding restrictions.	
Thiocarb (Larvin®3.2)	0.25-0.75 lb./acre	28	Do not graze or feed to livestock.	
Chlorpyrifos (Lorsban®4E)	0.25-0.5 lb./acre	28	Do not graze or feed to livestock.	
Diflubenzuron (Dimilin®25W)	0.125-0.25 lb./acre	21	Do not graze or feed to livestock.	
(Dimilin®2L)	0.125-0.25 lb./acre	21	Do not graze or feed to livestock.	
Methyl parathion (Penncap-M®)	0.5-0.75 lb./acre	20	20	Do not apply within 6 hours of rain.
Bacillus thuringiensis, ss. *kurstaki* (Javelin®WG)	0.25-1.5 lbs./acre	0	X	
(Costar®)	0.12-0.75 lb./acre	0	X	
(Biobit®XL)	1.5-3.0 lbs./acre	0	X	
(Biobit®XL)	0.5-1.0 lb./acre	0	X	
(DiPel®ES, 1st and 2nd instars)	1-2 pts./acre	X	X	
(DiPel®2X, 1st and 2nd instars)	0.5-1 lb./acre	0	X	
(DiPel®DF, 1st and 2nd instars)	0.25-1 lb./acre	0	X	
(DiPel®4L, 1st and 2nd instars)	0.67-1.33 pts./acre	0	X	

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
		(DiPel®ES CPI, 1st and 2nd instars)	1-2 pts./acre	X	X	
		Bacillus thuringiensis, ss. *aizawai* (Agree®WG)	0.25-2 lbs./acre	0	X	
		(XenTari®)	0.5-1 lb./acre	0	X	
		(Design®, small larvae)	0.25-0.5 lb./acre (light) 0.5-1.5 lbs./acre (moderate) 1.5-2 lbs./acre (heavy)	0	X	
Threecornered alfalfa hopper *Spissistilus festinus* (Membracidae)	Before bloom, when the infestation has reduced the number of non-girdled plants to 6 or fewer per row-ft. (19.7 per row-m) and nymphs are still present. From pod set to maturity, when there are 3 nymphs per row-ft. (9.8 per row-m), or 1 adult per sweep.	Carbaryl (Sevin®80WSP)	1 lb./acre	14	14	This insect damages the plant stems and girdled plants may not be detected until the plants grow. Scouting for these insects should begin when plants emerge from the soil. Thorough coverage of plants is needed for early-season control.
		(Sevin®4F)	1 lb./acre	14	14	
		(Sevin®XLR plus)	1 lb./acre	14	14	
		Aldicarb (Temik® brand 15G Lock' n Load®)	0.75-1.5 lbs./acre	90	Do not graze or feed to livestock.	
		(Temik® brand 15G CP)	0.75-1.5 lbs./acre	90	Do not graze or feed to livestock.	
		Lambda-cyhalothrin (Karate®Z)	0.015-0.025 lb./acre	90	Do not graze or feed to livestock.	
		(Warrior®)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		Es-fenvalerate (Asana®XL)	0.03-0.05 lb./acre	21	Do not graze or feed to livestock.	

		Pyrethroid (Scout X-TRA®)	0.012-0.016 lb./acre	21	Do not graze or feed to livestock.	
		Tralomethrin (Scout X-TRA®Gel)	0.012-0.016 lb./acre	21	Do not graze or feed to livestock.	
		Dimethoate 4 EC	0.5 lb./acre	21	5	
		Dimethoate 400	0.5 lb./acre	21	5	
		Thiocarb (Larvin®3.2)	0.45-0.75 lb./acre (suppression only)	28	Do not graze or feed to livestock.	
		Methyl parathion (Penncap-M®)	0.5-0.75 lb./acre	20	20	Do not apply within 6 hours of rain.
		4-lb. Methyl parathion	0.38-1 lb./acre	20	20	
Green cloverworm *Plathypena scabra* (Noctuidae)	When defoliation exceeds 40 percent prebloom, 20 percent during blooming and pod fill, and 35 percent from pod fill to harvest. Or when 1/2-inch (12-mm) or larger larvae number 4 or more per row-ft. (13 larvae per row-m) or 150 per 100 sweeps. Four or more larger larvae per row-ft. (13 larvae per row-m) if diflubenzuron is to be used.	Azinphos-methyl (Sniper®2-E)	0.375-0.5 lb./acre	21 or 45 days depending upon dose	Do not graze or feed to livestock.	Green cloverworm is a general feeder on legume crops as well as on common weeds. Check infestations at weekly intervals to determine damage level.
		(Sniper®50 PVA)	0.75-1 lb./acre	45	Do not graze or feed to livestock.	
		Carbaryl (Sevin®80WSP)	0.53-1 lb./acre	13	14	
		(Sevin®4F)	0.5-1 lb./acre	14	14	
		(Sevin®XLR plus)	0.5-1 lb./acre	14	14	
		Lambda-cyhalothrin (Karate®Z)	0.015-0.025 lb./acre	21	Do not graze or feed to livestock.	
		(Warrior®)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		Es-fenvalerate (Asana®XL)	0.015-0.03 lb./acre	21	Do not graze or feed to livestock.	
		Permethrin (Pounce®25 WP)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
		(Pounce®3.2 EC)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce® WSB)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, wettable powder)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, water soluble pack)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		Tralomethrin (Scout X-TRA®)	0.012-0.016 lb./acre	21	Do not graze or feed to livestock.	
		(Scout X-TRA®Gel)	0.012-0.016 lb./acre	21	Do not graze or feed to livestock.	
		Methomyl (Lannate®SP)	0.125-0.25 lb./acre (see label for further details)	14	See label for feeding restrictions.	
		(Lannate®LV)	0.12-0.225 lb./acre (light to moderate) 0.225-0.45 lb./acre moderate to heavy)	14	See label for feeding restrictions.	
		Thiocarb (Larvin®3.2)	0.25-0.75 lb./acre	28	Do not graze or feed to livestock.	
		Chlorpyrifos (Lorsban®4E)	0.25-0.5 lb./acre	28	Do not graze or feed to livestock.	

Diflubenzuron (Dimilin®25W)	0.125-0.25 lb./acre	21	Do not graze or feed to livestock.
(Dimilin®2L)	0.125-0.25 lb./acre	21	Do not graze or feed to livestock.
Methyl parathion (Penncap-M®)	0.5-0.75 lb./acre	20	Do not apply within 6 20 hours of rain.
4-lb. Methyl parathion	0.5-1 lb./acre	20	20
Malathion (Malathion ULV)	0.619 lb./acre	0	7
Bacillus thuringiensis, ss. *kurstaki* (Javelin®WG)	0.25-1.5 lbs./acre	0	X
(Costar®)	0.12-0.75 lb./acre	0	X
(Biobit®XL)	1.5-5.5 lbs./acre	0	X
(Biobit®XL)	0.5-1.0 lb./acre	0	X
(DiPel®ES, 1st and 2nd instars)	1-2 pts./acre	X	X
(DiPel®2X, 1st and 2nd instars)	0.5-1 lb./acre	0	X
(DiPel®DF, 1st and 2nd instars)	0.25-1 lb./acre	0	X
(DiPel®4L, 1st and 2nd instars)	0.5-1 pt./acre	0	X
(DiPel®ES CPI, 1st and 2nd instars)	1-2 pts./acre	X	X
Bacillus thuringiensis, ss. *aizawai* (XenTari®)	0.5-1 lb./acre	0	X

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
Soybean looper *Pseudoplusia includens* (Noctuidae)	When defoliation exceeds 40 percent prebloom, 20 percent during blooming and pod fill, and 35 percent from pod fill to harvest. Or when 1/2-inch (12-mm) or larger larvae number 4 or more per row-ft. (26 larvae per row-m) or150 per 100 sweeps.	Lambda-cyhalothrin (Karate®Z, 1st and 2nd instars)	0.03 lb./acre	21	Do not graze or feed to livestock.	Soybean loopers can reach higher levels when cotton and soybeans are grown in close proximity. Early maturing soybean varieties often escape damaging populations. Larvae feed on the lower portion of plants, preferring mature foliage. They move towards the top of the plant as defoliation proceeds.
		(Warrior®, suppression only)	0.03 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T, suppression only)	0.03 lb./acre	45	Do not graze or feed to livestock.	
		Permethrin (Pounce® 25 WP)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce® 3.2 EC)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce® WSB)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, wettable powder)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, water soluble pack)	0.1-0.2 lb./acre	60	Do not graze or feed to livestock.	
		Tralomethrin (Scout X-TRA®, suppression only)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	
		(Scout X-TRA®Gel, suppression only)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	
		Thiocarb (Larvin®3.2)	0.45-0.75 lb./acre	21	Do not graze or feed to livestock.	
		Diflubenzuron (Dimilin®25W)	0.25 lb./acre (suppression only)	21	Do not graze or feed to livestock.	

		(Dimilin®2L)	0.06 lb./acre	21	Do not graze or feed to livestock.	
		Methyl parathion (Penncap-M®)	0.5-0.75 lb./acre	20	20	Do not apply within 6 hours of rain.
		Bacillus thuringiensis, ss. *kurstaki*				
		(Javelin®WG)	0.25-1.5 lbs./acre	0	X	
		(Costar®)	0.12-0.75 lb./acre	0	X	
		(Biobit®XL)	1.0-3.0 lbs./acre	0	X	
		(Biobit®XL)	0.5-1 lb./acre	0	X	
		(DiPel®ES, 1st and 2nd instars)	1-2 pts./acre	X	X	
		(DiPel®2X, 1st and 2nd instars)	0.5-1 lb./acre	0	X	
		(DiPel®DF, 1st and 2nd instars)	0.5-1 lb./acre	0	X	
		(DiPel®4L, 1st and 2nd instars)	1-2 pts./acre	0	X	
		(DiPel®ES CPI, 1st and 2nd instars)	1-2 pts./acre	X	X	
		Bacillus thuringiensis, ss. *aizawai*				
		(Agree®WG)	0.25-2 lbs./acre	0	X	
		(XenTari®)	0.5-1 lb./acre	0	X	
		(Design®, small larvae)	0.25-0.5 lb./acre (light) 0.5-1.5 lbs./acre (moderate) 1.5-2 lbs./acre (heavy)	0	X	
Cabbage looper *Trichoplusia ni* (Noctuidae)	When defoliation exceeds 40 percent prebloom, 20 percent during blooming and pod fill, and 35 percent from pod fill to harvest. Or when 1/2-inch (12-mm) or larger larvae number 8 or more per	4-lb. Methyl parathion	0.5-1 lb./acre	20	20	Larvae feed on the lower portion of plants, preferring mature foliage. They move towards the top of the plant as defoliation proceeds.
		Lambda-cyhalothrin (Karate®Z)	0.015-0.025 lb./acre	21	Do not graze or feed to livestock.	
		(Warrior®)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
	row-ft. (26 larvae per row-m) or 150 per 100 sweeps.	(Warrior®T)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		Es-fenvalerate (Asana®XL)	0.03-0.05 lb./acre	21	Do not graze or feed to livestock.	
		Permethrin (Pounce® 25 WP)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce® 3.2 EC)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce® WSB)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, wettable powder)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25W, water soluble pack)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		Tralomethrin (Scout X-TRA®)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	
		(Scout X-TRA®Gel)	0.016-0.024	21	Do not graze or feed to livestock.	
		Thiocarb (Larvin®3.2)	0.45-0.75 lb./acre	28	Do not graze or feed to livestock.	
		Bacillus thuringiensis, ss. *Kurstaki* (Javelin®WG)	0.25-1.5 lbs./acre	0	X	
		(Costar®)	0.12-0.75 lb./acre	0	X	

		(Biobit®XL)	1.5-5.5 lbs./acre	0	X	
		(Biobit®XL)	0.5-1.0 lb./acre	0	X	
		(DiPel®ES, 1st and 2nd instars)	1-2 pts./acre	X	X	
		(DiPel®2X, 1st and 2nd instars)	0.5-1 lb./acre	0	X	
		(DiPel®DF, 1st and 2nd instars)	0.5-1 lb./acre	0	X	
		(DiPel®4L, 1st and 2nd instars)	1-2 pts./acre	0	X	
		(DiPel®ES CPI, 1st and 2nd instars)	1-2 pts./acre	X	X	
		Bacillus thuringiensis, ss. *aizawai*				
		(Agree®WG)	0.25-2 lbs./acre	0	X	
		(XenTari®)	0.5-1 lb./acre	0	X	
		(Design®, small larvae)	0.25-0.5 lb./acre (light) 0.5-1.5 lbs./acre (moderate) 1.5-2 lbs./acre (heavy)	0	X	
Bean leaf beetle *Cerotoma trifurcata* (Chrysomelidae)	When defoliation exceeds 40 percent prebloom, 20 percent during blooming to pod fill, and 35 percent from pod fill to harvest. Banded cucumber beetle, *Diabrotica balteata* (Chrysomelidae), is often present but rarely causes economic damage.	Azinphos-methyl (Sniper®2-E)	0.375-0.5 lb./acre	21 or 45 days depending upon dose	Do not graze or feed to livestock.	Larvae of bean leaf beetles feed on plant roots, root hairs and nodules, while adults defoliate leaves and pods.
		(Sniper®50 PVA)	0.75-1 lb./acre	45	Do not graze or feed to livestock.	
		Carbaryl (Sevin®80WSP)	0.53-1 lb./acre	14	14	
		(Sevin®4F)	0.5-1 lb./acre	14	14	
		(Sevin®XLR plus)	0.5-1 lb./acre	14	14	

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
		Lambda-cyhalothrin (Karate®Z)	0.015-0.025 lb./acre	21	Do not graze or feed to livestock.	
		(Warrior®)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T)	0.015-0.025 lb./acre	45	Do not graze or feed to livestock.	
		Es-fenvalerate (Asana®XL)	0.03-0.05 lb./acre	21	Do not graze or feed to livestock.	
		Permethrin (Pounce® 25 WP)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce® 3.2 EC)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Pounce® WSB)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25, wettable powder)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		(Ambush®25, water soluble pack)	0.05-0.1 lb./acre	60	Do not graze or feed to livestock.	
		Dimethoate 4 EC	0.5 lb./acre	21	5	
		Dimethoate 400	0.5 lb./acre	21	5	
		5-lb. Dimethoate	0.5 lb./acre	21	5	
		Methomyl (Lannate®SP)	0.25-0.5 lb./acre (See label for further details)	14	See label for feeding restrictions.	
		(Lannate®LV)	0.225-0.3 lb./acre (light to moderate) 0.3-0.45 lb./acre (moderate to heavy)	14	See label for feeding restrictions.	

		Thiocarb (Larvin®3.2)	0.45-0.75 lb./acre	28	Do not graze or feed to livestock.	
		Chlorpyrifos (Lorsban®4E)	0.5-1 lb./acre	28	Do not graze or feed to livestock.	
		Methyl parathion (Penncap-M®)	0.5-0.75 lb./acre	20	20	Do not apply within 6 hours of rain.
		4-lb. Methyl parathion	1 lb./acre	20	20	
Blister beetles ***Epicauta funebris, Epicauta vittata*** **(Meloidae)**	When defoliation exceeds 40 percent prebloom, 20 percent during blooming to pod fill, and 35 percent from pod fill to harvest.	Carbaryl (Sevin®80WSP)	0.53-1 lb./acre	14	14	Blister beetle larvae are considered beneficial because they destroy grasshopper eggs, but the adults defoliate plants. When the beetles are crushed or rubbed, they produce a fluid that causes blisters on human skin.
		(Sevin®4F)	0.5-1 lb./acre	14	14	
		(Sevin®XLR plus)	0.5-1 lb./acre	14	14	
		4-lb. Methyl parathion	0.38-1 lb./acre	20	20	
		Methoxychlor 2 EC	0.75-3 lbs./acre	7	Do not graze or feed to livestock.	
		Lambda-cyhalothrin (Karate®Z)	0.025-0.03 lb./acre	21	Do not graze or feed to livestock.	
		(Warrior®)	0.025-0.03 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T)	0.025-0.03 lb./acre	45	Do not graze or feed to livestock.	
Stink bugs ***Nezara viridula, Acrosternum hilare, Euschistus servus*** **(Pentatomidae)**	From pod formation to bean maturity, when there is 1 bug per row-ft. (3.3 per row-m), or 36 or more per 100 sweeps. Stink bugs should be 1/4 inch (6 mm) or larger. (Some recommend the threshold be 0.3 bugs per row-ft. from bloom through mid-pod fill.)	Azinphos-methyl (Sniper®2-E)	0.375-0.5 lb./acre	21 or 45 days depending upon dose	Do not graze or feed to livestock.	Soybeans are subject to damage from the time the bean pods start forming until the beans are mature. Protecting soybeans from injury during pod set and early pod fill will reduce the incidence of delayed maturity (green bean effect)
		(Sniper®50 PVA)	0.75-1 lb./acre	45	Do not graze or feed to livestock.	
		Carbaryl (Sevin®80WSP)	1-1.5 lbs./acre	14	14	
		(Sevin®4F)	1-1.5 lbs./acre	14	14	
		(Sevin®XLR plus)	1-1.5 lbs./acre	14	14	

Soybean Insect Control Suggestions (continued)

Pests[1,2]	Economic threshold	Insecticide	Rate[3] (active ingredient/unit area)	Days from last application to: harvest	Days from last application to: livestock grazing or feeding[4]	Remarks
		Lambda-cyhalothrin (Karate®Z)	0.025-0.03 lb./acre	21	Do not graze or feed to livestock.	
		(Warrior®)	0.025-0.03 lb./acre	45	Do not graze or feed to livestock.	
		(Warrior®T)	0.025-0.03 lb./acre	45	Do not graze or feed to livestock.	
		Es-fenvalerate (Asana®XL)	0.03-0.05 lb./acre	21	Do not graze or feed to livestock.	
		Tralomethrin (Scout X-TRA®)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	
		(Scout X-TRA®Gel)	0.016-0.024 lb./acre	21	Do not graze or feed to livestock.	
		Thiocarb (Larvin®3.2)	0.45-0.75 lb./acre	28	Do not graze or feed to livestock.	
		Chlorpyrifos (Lorsban-4E)	1 lb./acre	28	Do not graze or feed to livestock.	
		Methyl parathion (Penncap-M®)	0.25-0.75 lb./acre	20	20	Do not apply within 6 hours of rain.
		4-lb. Methyl parathion	0.38-1 lb./acre	20	20	

[1]Mexican bean beetle, Japanese beetle, thrips, lygus bug, seedcorn maggot, white grub, wireworm, aphid, leafhopper, cucumber beetle, alfalfa caterpillar, woolly bear caterpillar, painted lady (thistle caterpillar), garden webworm, silver-spotted skipper and two-spotted spider mite are not included in this guide, as they have not been found to be pests of Texas soybeans. The Mexican bean beetle and Japanese beetle have not been found in sufficient numbers to affect soybean production in Texas.

[2]Often a complex of caterpillar defoliators, including loopers, velvetbean caterpillar and green cloverworm, attack soybeans. Because damage by these species is similar and additive, use the same economic threshold for the insect complex. Treat when defoliation by this complex exceeds 40 percent prebloom, 20 percent during bloom and pod fill, and 35 percent from pod fill to harvest.

[3]To convert lbs./acre to kg/hectare use the formula: $\frac{\text{lbs./acre}}{0.892}$ = kg/hectare

[4]An "X" indicates that restrictions on livestock grazing or feeding are not mentioned on the product label.

Restrictions

Refer to product labels for endangered species restrictions.

Carbaryl—Do not apply a combination of carbaryl and 2,4 DB herbicides to soybeans. Use lower rates for light to moderate populations and smaller instars and to provide maximum survival of beneficial insects and spiders. Use higher rates for heavy populations and larger instars. For grasshopper control, use the lower rate for nymphs on small plants or sparse vegetation in wasteland, rangeland, ditchbanks, rights-of-way, pastures, hedgerows and roadsides. Use the higher (1.5 lbs. AI/acre) rate for adult grasshoppers or applications to dense vegetation. Also labeled for cucumber beetles, alfalfa caterpillar, leafhoppers, thrips, webworms and painted ladies (thistle caterpillars)

Chlorpyrifos—Apply as broadcast spray using either aerial or ground equipment. Reapply as necessary to maintain control. On determinate soybeans, do not make more than one application after pod set. Also labeled for spider mite control (0.25 to 0.5 lb. AI/acre). When mites and eggs are in large numbers, apply a second spray 3 to 5 days after initial treatment to control newly hatched nymphs. Lorsban may also be applied through sprinkler irrigation systems. Do not apply more than 3 lbs. AI chlorpyrifos per acre per season, nor apply the last two treatments closer than 14 days apart.

Diflubenzuron—See discussion in "Biological insecticides." For aerial application, apply when larvae are small (less than 1/2 inch). Apply in sufficient (1 to 3 gals. per acre) water to achieve uniform coverage of foliage. For ground application, apply recommended rate in 9 to 35 gals. of water per acre to achieve uniform coverage. Do not make more than two applications per season. From 3 to 5 days may be required before populations are reduced. Do not rotate crops other than soybeans or cotton until 6 months following last application. Do not apply to lakes, streams, ponds or other bodies of water.

Es-fenvalerate—Do not feed or graze livestock on treated plants. Do not exceed 0.2 lb. AI per acre per season. When applying in nonvoliatile vegetable oils use a total spray volume of 1 or more quarts.

Methomyl—Also labeled for thrips. For aerial application of Lannate® LV as a low-volume spray, ensure that equipment is capable of delivering small spray droplets for thorough coverage, and that equipment is adjusted to distribute spray uniformly over the spray swath. Apply when wind, temperature and humidity will allow spray to be delivered to the target area. Make sure local regulations do not prohibit low-volume aerial sprays. Apply in a minimum total spray volume of 0.53 gal. per acre. Water or once-refined vegetable oil may be used as the spray carrier. Continue to apply at 5- to 7-day intervals or as needed to maintain control.

Methyl parathion—Do not apply more than twice per growing season. Products containing methyl parathion are also registered for use on thrips, garden webworms, two-spotted spider mites, leafhoppers, and silver-spotted skippers.

Permethrin—Apply by air or ground. Do not apply more than 0.4 lbs. AI per acre per season. Apply Pounce® 25 WP in a minimum of 1 gal. finished spray per acre by air or 5 gallons with ground equipment. When applying Pounce® 3.2EC in nonvolatile vegetable oil, apply in a minimum of 1 qt. total volume per acre using equipment calibrated to give adequate coverage. When applying in water by aircraft, 1 qt. of oil may be substituted for 1 qt. water per gallon of finished spray.

Thiodicarb—Apply in a minimum finished spray volume of 2 gals. per acre by air or 5 gals. per acre by ground. Use lower rates for low to moderate populations and maximum protection of beneficials. Refer to product label for special instructions for cutworm applications.

Tralomethrin—For aerial applications, use a minimum of 1 gal. of water per acre or 1 qt. of at least once-refined crop oil per acre. For ground applications, use a minimum of 5 gals. of water per acre for thorough coverage of the foliage.

Additional Insecticide Products Registered For Use On Soybeans (Note: The information below is presented for completeness of available product information only. This listing does not constitute a recommendation for use of these products in Texas soybean production.)

Carbofuran (Furadan® 4F) — Labeled for grasshopper control as a foliar application using 1/4 to 1/2 pt. in 20 or more gals. of water per acre. Do not apply within 21 days of harvest and do not graze or feed foliar-treated forage to livestock or cut for silage or hay.

Dichloropropene (Telone®II, Telone®C-17) — Labeled for wireworms.

Ethyl phosphosphorodithioate (Di-Syston®15%) — Labeled for aphids, leafhoppers, mites, thrips (except flower thrips), and Mexican bean beetle. Place granules in a 4-inch band over the seed furrow behind the planter shoe and in front of the press wheel, or in a band on each side of the seed furrow at planting time. 6.7 lbs./acre. Allow at least 75 days between application and harvest for forage or hay.

Malathion (Malathion ULV Concentrate) — Labeled for grasshopper and green cloverworm control at a rate of 8 fl. oz. per acre, undiluted. Do not harvest or graze for 7 days following application.

Metaldehyde (Metaldehyde 7.5G) — Labeled for slugs and snails.

Methoxychlor (Methoxychlor 4L) — Labeled for velvetbean caterpillar, blister beetles, garden webworm, leafhopper and fall armyworm at a rate of 1 to 3 qts. per acre, with a pre-harvest interval of 7 days.

Neem oil (Trilogy®) — Labeled as a broad-spectrum miticide/insecticide/fungicide.

Permethrin plus methyl parathion (Pounce® Plus Methyl Parathion 2-5EC) — Labeled for control of cabbage looper, corn earworm, soybean looper, velvetbean caterpillar, bean leaf beetle, alfalfa looper and garden webworm at 6.4 to 12.8 fl. oz. per acre and for stink bug and threecornered alfalfa hopper at a rate of 12.8 fl. oz. per acre. This product is convenient when a complex of pests occurs that does not respond to the ingredients in this product applied separately. Application may be made with air or ground equipment. Use a minimum of 1 gal. of water per acre with aircraft or 5 gals. of water per acre with ground equipment. Do not make more than two applications per season. Do not apply within 40 days of harvest. Do not feed or graze soybean forage. Do not plant rotational crops within 60 days of last application.

Phorate (Thimet® 15G and 20G) — Labeled for the early season control of thrips, mites and other insects as an at-plant application at a rate of 12 oz. (Thimet 15G) and 9.0 oz. (Thimet 20G) per 1000 feet of row.

N-methyl carbamate (Slam®) — Labeled for control of diabroticine beetle adults. Apply 0.5-0.75 lb/acre. 0 days pre-harvest interval.

Conversion table: Pounds of active ingredients (AI) per acre to amount of formulation per acre. For additional conversions use these formulas:
lb. AI per acre ÷ lb. formulation per gal. = gal. formulation per acre; lb. AI formulation per acre ÷ % AI formulation per acre ÷ 100 = lb. formulation per acre
Note: 1 gal. = 4 qts. = 8 pts. = 128 fl. oz.

Insecticide and formulation	Pounds of active ingredients (AI) per acre converted to amount actual product per acre
carbaryl	
Sevin® 80S	0.5 lb. AI. = 0.63 lb./acre; 1.0 lb. AI = 1.25 lbs./acre; 1.5 lbs. AI = 1.87 lbs./acre; 2.0 lbs. AI = 2.5 lbs./acre
Sevin® 50WP	0.5 lb. AI. = 1.0 lb./acre; 1.0 lb. AI = 2.0 lbs./acre; 1.5 lbs. AI = 3.0 lbs./acre; 2.0 lbs. AI = 4.0 lbs./acre
Sevin® XLR Plus	0.5 lb. AI. = 0.5 qt./acre; 1.0 lb. AI = 1.0 qt./acre; 1.5 lbs. AI = 1.5 qts./acre; 2.0 lbs. AI = 2.0 qts./acre
chlorpyrifos	
Lorsban® 4E	0.25 lb. AI = 0.5 pt./acre; 0.5 lb. AI = 1.0 pt./acre; 0.75 lb. AI = 1.5 pts./acre; 1.0 lb. AI = 2.0 pts./acre
Lorsban® 15G	5.7 lbs. AI = 38.0 lbs./acre
diflubenzuron	
Dimilin® 25W	0.03125 lb. AI = 2.0 oz./acre; 0.0625 lb. AI = 4.0 oz./acre
es-fenvalerate	
Asana® 1.9EC	0.0125-0.025 lb. AI = 0.85-1.7 fl. oz./acre; 0.025 0.05 lb. AI = 1.7-3.4 fl. oz./acre
methomyl	
Lannate® LV	0.13 to 0.25 lb. AI = 0.43 to 0.83 pts./acre; 0.38 lb. AI = 1.27 pts./acre; 0.5 lb. AI = 1.67 pts./acre; 1.0 lb. AI = 3.3 pts./acre
methyl parathion	
Methyl Parathion 4E and MP 4 EC	0.25 lb. AI = 0.5 pt./acre; 0.38 lb. AI = 0.76 pt./acre; 0.5 lb. AI = 1.0 pt./acre; 1.0 lb. AI = 2.0 pts./acre
Methyl Parathion 7.5	0.25 lb. AI = 0.27 pt./acre; 0.38 lb. AI = 0.41 pt./acre; 0.5 lb. AI = 0.53 pt./acre; 1.0 lb. AI = 1.1 pts./acre
Penncap-M	0.25 lb. AI = 1.0 pt./acre; 0.5 lb. AI = 2.0 pts./acre; 0.75 lb. AI = 3.0 pts./acre; 1.0 lb. AI = 4.0 pts./acre
permethrin	
Ambush® 25W and Pounce® 25WP	0.05 lb. AI = 3.2 oz./acre; 0.1 lb. AI = 6.4 oz./acre; 0.2 lb. AI = 12.8 oz./acre
Ambush® 25W and Pounce® 3.2EC	0.05 lb. AI = 2.0 fl. oz./acre; 0.1 lb. AI = 4.0 fl. oz./acre; 0.2 lb. AI = 8.0 fl. oz./acre
thiodicarb	
Larvin® 3.2	0.25-0.4 lb. AI = 10.0-16.0 fl. oz./acre; 0.45-0.75 lb. AI = 18.0-30.0 fl. oz./acre; 0.5-0.75 lb. AI = 20.0-30.0 fl. oz./acre
tralomethrin	
Scout®	0.014-0.017 lb. AI = 6.0-7.0 fl. oz./acre; 0.015-0.019 lb. AI = 6.4-8.0 fl. oz./acre
Scout® X-tra™	0.012-0.016 lb. AI = 1.73-2.33 fl. oz./acre; 0.016-0.024 lb. AI = 2.33-3.33 fl. oz./acre

Beet Armyworm

Silver spotted skipper

Southern green stinkbug

Saltmarsh catarpillar

Banded cucumber beetle

Soybean stem borer

Soybean thrips

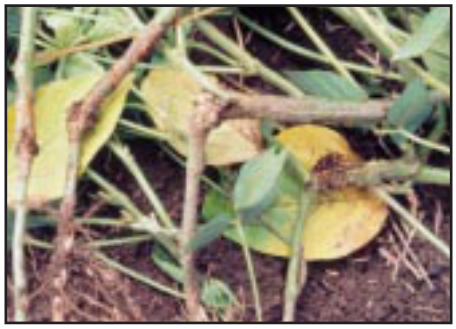
Bean leaf beetle

Blister beetle

Photographs provided by Bastiaan Drees, Michael O. Way and Noel Troxclair.

Geeen clover worm

Velvet bean caterpillar



Three-cornered alfalfa hopper

Corn earworm

Fall armyworm

Black cutworm

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